



Original Communication

Acute pesticide poisoning related deaths in Tehran during the period 2003–2004

Kambiz Soltaninejad PhD*, Mansoor Faryadi MSc, Fariba Sardari DLS

Forensic Toxicology Laboratory, Legal Medicine Organization, Tehran, Iran

Received 2 October 2006; received in revised form 5 December 2006; accepted 6 December 2006

Available online 26 March 2007

Abstract

Acute pesticide poisoning is an important cause of morbidity and mortality in Iran and worldwide. Determination of inducing factors in pesticide poisoning is very important parameter for planning of preventive and controlling programs. The aim of present study is assessing of effects of epidemiological variables on fatal pesticide poisoning.

Data was obtained from autopsies on suspected pesticide poisoning deaths were performed in the Tehran Legal Medicine Center between 2003 and 2004. Among these medicolegal autopsies, fatal poisoning cases were evaluated retrospectively by reports of toxicological analysis. The variables such as age, sex, job, residential location, educational level, type of pesticide and cause of poisoning were reviewed.

From total of 3885 autopsies referred to forensic toxicology laboratory for pesticide toxicology analysis, 51 (1.31%) deaths were due to pesticide poisoning. The age of cases was 32 ± 17 years old. 63.3% of cases were male and 36.7% of them were female. The majority of cases (31.4%) were housekeeper and 23.5% were student. 66.7% of cases were lived in urban and 33.3% were lived in rural area. The most common type of poisoning was suicide (52.9%). 33.3% of cases had primary education. The common type of pesticide in this study was aluminum phosphide 18 (35.8%) and organophosphates 17 (33.3%).

According to fatal aluminum phosphide poisoning, more stringent legislation and enforcement regarding the sale and distribution of this toxic substance is needed. Thus substitution of this pesticide with safer agents is necessary.

© 2007 Elsevier Ltd and FFLM. All rights reserved.

Keywords: Pesticide; Fatal poisoning; Tehran

1. Introduction

Acute pesticides poisoning is an important cause of morbidity and mortality worldwide. It has been estimated that around three million severe cases of acute pesticides poisoning occur each year with some 220 000 deaths.¹ 95% of fatal pesticide poisoning occurs in developing countries.¹ In Iran, there are more than 500 different pesticide compounds available for agricultural uses.² In previous studies, it was indicated that pesticides are the third most common

cause of poisoning and principal cause of poisoning related mortality in Iran.^{2,3}

Pesticides are widely used and available, therefore the intentional poisoning of these compounds is one of the most common causes of chemical poisoning in Iran. All fatal pesticide poisoning cases from Tehran and nearby towns are referred to Tehran legal medicine center (TLMC) for medicolegal investigations. Thus the retrospective study on pesticide poisoning related deaths which referred to TLMC is a suitable information sources about fatal pesticides poisoning in Tehran and data which collected from this study is very important for preventive public health planning. For these reasons, this study was performed to determine the epidemiological affecting variables in fatal pesticide poisoning.

* Corresponding author. Tel.: +98 21 55 60 80 04; fax: +98 21 55 60 80 65.

E-mail address: kamsoltani@yahoo.com (K. Soltaninejad).

2. Material studied

In this retrospective-descriptive study, the cases of suspected pesticide poisoning in Tehran from autopsies performed in TLMC between January 2003 and December 2004 were studied. Data was collected from reports of toxicological analysis.

The positive cases have been studied, in order to identify the used pesticide, as well as the etiology. The frequency of intoxication and its distribution by sex, age, residential location, marital status, job, type of poisoning, educational status and season of poisoning were also analyzed. A questionnaire was designed and data from all cases were obtained. The Statistical Package for Social Sciences (SPSS) version 11.5 was used to analysis of data.

3. Results

In this period, from total of 3885 pesticide poisoning suspected cases, 51 (1.31%) of them were related with fatal pesticide poisoning death.

In 2003 from total of 1732 suspected cases, 20 (1.15%) of them were related with fatal pesticide poisoning death. In 2004, the suspected cases increased to 2153 with 31 (1.44%) fatal pesticide poisoning related death.

The age of cases was 32 ± 17 (mean \pm SD) years old. The highest frequency of poisoning (65.3%) was found in the age group equal or less than 30 years old.

63.3% of cases were male and 36.7% were female. Male to female ratio was 1.72:1.

Cases included a variety of intentional (52.9%), accidental (7.9%) and unknown (39.2%) poisoning.

64.9% of cases were single and the remainders (35.1%) were married. 66.7% of cases were located in urban areas and remainders (33.3%) were located in rural regions. The highest frequency of cases according to job was housekeepers (31.4%) and then students (23.5%) (Table 1).

Majority of cases had primary school education (33.3%) (Table 2).

The frequency of pesticides poisoning was greater in autumn (39.2%) followed by winter (23.5%), summer (23.5%) and spring (13.7%).

Insecticides were the most frequent cause of fatal pesticides poisoning (62.7%), followed by aluminum phosphide (35.3%).

Table 1
Job status of fatal pesticide poisoning cases

Job status	Number of cases	Percent
House keeper	16	31.4
Student	12	23.5
Farmer	10	19.6
Worker	5	9.8
Jobless	5	9.8
Other	3	5.9
Total	51	100

Table 2
Educational level of fatal pesticide poisoning cases

Education level	Number of cases	Percent
Primary	17	33.3
Guidance	14	27.5
High school	11	21.6
Illiterate	3	5.9
Unknown	6	11.7
Total	51	100

Table 3
Insecticide classes induced fatal pesticide poisoning

Insecticide classes	Number of cases	Percent
Organophosphates	17	53.1
Organochlorates	14	43.7
Carbamates	1	3.2
Total	32	100

Table 4
Detected organophosphates in fatal pesticide poisoning cases

Organophosphates	Number of cases	Percent
Malathion	8	47
Diazinon	3	17.6
Azinphos	2	11.8
Chlorpyrifos	1	5.9
Dichlorvus	1	5.9
Ethion	1	5.9
Pyrimifos	1	5.9
Total	17	100

Table 5
Detected organochlorates in fatal pesticide poisoning cases

Organochlorates	Number of cases	Percent
Endosulfan	8	57.1
Heptachlor	3	21.4
Aldrin	2	14.3
Dieldrin	1	7.2
Total	14	100

In insecticides, organophosphates were most frequent (53.1%) followed by organochlorate (43.7%), carbamate (3.2%) (Table 3).

In organophosphate, malathion (47%) and in organochlorate, Endosulfan (57.1%) was most frequent insecticides (Tables 4 and 5). One case of paraquat and one case of propoxur (a carbamate insecticide) intoxication were found.

4. Discussion

Present study indicates that the fatal pesticides self-poisoning in age group equal or less than 30 years old is most common, with higher frequency in men and predominant in unmarried cases. A possible explanation could be that younger persons were easily excited, enraged, depressed and attempted drastic steps like suicide; on the other hand,

the more elderly individuals took more mature decisions. Our findings regard involvement of the younger age group in poisoning in comparison with other age groups.⁴ Nesime et al. showed that almost half of acute agrochemical poisoning in Turkey were less than 30 years old of cases.⁵

In present study, intentional poisonings were more common (52.9%) than accidental. It was supported by previous studies.^{3,6,7}

In this study, the higher mortality in males than in females is in agreement with the previous reports.^{2,3,7,8}

Vougiouklakis et al. showed that higher rates of suicide in widow or unmarried persons.⁹

Easily available pesticide and socioeconomic problems of the cases, particularly from urban areas were the main causes of the intentional pesticide poisoning. The residential location of suicide cases in this study differ from previous studies^{2,3} and similar to Malawi.¹⁰

The overall number of fatal pesticide poisoning cases were higher in autumn than other seasons, while in previous studies a peak of self poisoning was in spring and summer.^{3,6} This pattern of seasonal distribution in this study differs from other studies and its reason is unclear to us.

A rising trend of fatal pesticide poisoning in 2004 was observed and cause of this increase is unclear.

Insecticides were the first cause of deaths in this study. These data supported by previous studies in Iran.^{2,3,7,11}

In spite of minimal usage of organochlorates compounds due to limited availability, the mortality rate from these compounds is high. These results may be due to high toxicity of these compounds and absence of especial antidote for treatment of these poisonings.^{1,12}

Carbamates had low mortality rate in this study and this result is due to low toxicity of these insecticides.^{1,12}

Our results showed that aluminum phosphide alone was the most important cause of mortality in pesticides poisoning. This type of poisoning has also been noted in other countries,^{13–16} and may reflect the increased availability and exposure to this agent. In Iran, these compounds known as “rice tablets” by the public and widely used as pest control in grain silos especially rice.¹⁷ Severe acidosis and resistant hypotension resulting in high mortality rate and the main problem noted in these cases.^{1,11,18}

In this study, there was one paraquat poisoning death. This may be due to the low usage of this herbicide in Iran.

In summary, pesticides are the most important agents in fatal poisoning and aluminum phosphide has emerged as an agent for choice to commit suicide, especially in younger age group because it is chip, easily available and highly

lethal. Therefore, more stringent legislation and enforcement regarding the sale and distribution of this toxic substance is needed.

References

- Ellenhorns MJ, Schonwald S, Ordog G, Wasserberger J. *Ellenhorn's medical toxicology: diagnosis and treatment of human poisoning*. 2nd ed. Maryland: Williams & Wilkins; 1997.
- Abdollahi M, Jalali N, Sabzevari O, Nikfar S, Fallahpour M. Pesticide poisoning during an 18-month period (1995–1997) in Tehran, Iran. *Iran J Med Sci* 1999;**24**:77–81.
- Abdollahi M, Jalali N, Sabzevari O, Hoseini R, Ghane T. A retrospective study of poisoning in Tehran. *J Toxicol Clin Toxicol* 1997;**35**:387–93.
- Goksu S, Yildirim C, Kocoglu H, Tutak A, Oner U. Characteristics of acute adult poisoning in Gaziantep, Turkey. *J Toxicol Clin Toxicol* 2002;**40**:833–7.
- Nesime Y, Lokman B, Akif IM, Gurol C, Basar C, Mustafa K. Acute pesticide poisoning related deaths in Turkey. *Vet Hum Toxicol* 2004;**46**:342–4.
- Afshari R, Majdzadeh R, Balali-mood M. Pattern of acute poisoning in Mashhad, Iran, 1993–2000. *J Toxicol Clin Toxicol* 2004;**42**:965–73.
- Ghazi-Khansari M, Oreizi S. A prospective study of fatal outcomes of poisoning in Tehran. *Vet Hum Toxicol* 1995;**37**:449–52.
- Mohanty MK, Kumar V, Bastia BK, Arun M. An analysis of poisoning deaths in Manipal, India. *Vet Hum Toxicol* 2004;**46**:208–9.
- Vougiouklakis T, Boumba VA, Mitselou A, Peschos D, Gerontopoulos K. Trends in suicide mortality in the deprived region of Epirus (North-West Greece) during the period 1998–2002. *Med Sci Law* 2005;**45**:39–46.
- Dzamalala CP, Milner DA, Liomba NG. Suicide in Blantyre, Malawi (2000–2003). *J Clin Forensic Med* 2006;**13**:65–9.
- Jalali N, Pajoumand A, Abdollahi M, Shadnia Sh. Epidemiological survey of poisoning mortality in Tehran during 1997–1998. *Toxicol Lett* 2000;**116**:84.
- Haddad LM, Shannon MW, Winchester JF. *Clinical management of poisoning and drug overdose*. 3rd ed. Philadelphia: W.B. Saunders; 1998.
- Abder-Rahman HA, Battah AH, Ibraheem YM, Shomaf MS, El-batain N. Aluminium phosphide fatalities, new local experience. *Med Sci Law* 2000;**40**:164–8.
- Chugh SN, Aggarwal HK, Mahajan SK. Zinc phosphide intoxication symptom: analysis of 20 cases. *Int J Clin Pharmacol Ther* 1998;**36**:406–7.
- Singh D, Jit I, Tyagi S. Changing trends in acute poisoning in Chandigarh zone: 25-year autopsy experience from a tertiary care hospital in northern India. *Am J Forensic Med Pathol* 1999;**20**:203–10.
- Singh S, Singh D, Wig N, Jit I, Sharma BK. Aluminium phosphide ingestion – a clinico-pathologic study. *J Toxicol Clin Toxicol* 1996;**34**:703–6.
- Moghaddamnia AA, Abdollahi M. An epidemiological study of poisoning in Northern Islamic Republic of Iran. *East Mediterr Health J* 2002;**8**:88–94.
- Chomchai S. Phosphine and phosphides. In: Olson KR, editor. *Poisoning and Drug Overdose*. New York: Mc Graw Hill; 2004. p. 306–7.